414 Rec'd PCT/PTO 15 NOV 1999

FORM PTO-1390 (REV. 5-93)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 2345/103
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/423948

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP98/02494	(28.04.98) 28 April 1998	(15.05.97) 15 May 1997

TITLE OF INVENTION
INTERFEROMETER TUNABLE IN A NON-MECHANICAL MANNER BY A PANCHARATNAM PHASE

APPLICANT(S) FOR DO/EO/US
DULTZ, Wolfgang; BERESNEV, Leonid and HILS, Bernhard

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371
3. ☒ This express request to begin national examination procedures (35 U.S.C 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1)
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date
5. ☒ A copy of the International Application as filed (35 U.S.C 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C 371(c)(3)).
9. An oath or declaration of the inventor(s) (35 U.S.C 371(c)(4))
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5))

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
    ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: Preliminary Examination Report and International Search Report.

EXPRESS MAIL NO. EL179103801US

420 Rec'd PCT/PTO 15 NOV 1999

U.S. APPLICATION NO. if known, see 37 C.F.R.1.5	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/423948	PCT/EP98/02494	2345/103

17. ☒ The following fees are submitted:

	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Search Report has been prepared by the EPO or JPO $840.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) . $670.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $760 00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO $970.00		
International preliminary examination fee paid to USPTO (37 CFR 1 482) and all claims satisfied provisions of PCT Article 33(2)-(4) $96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840	
Surcharge of $130 00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1 492(e))	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	5 - 20 =	0	X $18.00	$ 0	
Independent Claims	1 - 3 =	0	X $78 00	$ 0	
Multiple dependent claim(s) (if applicable)			+ $260.00	$ 0	
			TOTAL OF ABOVE CALCULATIONS =	$ 840	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1 9, 1.27, 1 28).				$	
			SUBTOTAL =	$ 840	
Processing fee of $130.00 for furnishing the English translation later the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$	
			TOTAL NATIONAL FEE =	$ 840	
Fee for recording the enclosed assignment (37 CFR 1.21(h)) The assignment must be accompanied by an appropriate cover sheet (37 CFR 3 28, 3.31) $40.00 per property			+	$	
			TOTAL FEES ENCLOSED =	$ 840	
			Amount to be: refunded	$	
			charged	$	

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed

b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of **$840.00** to cover the above fees A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600 A duplicate copy of this sheet is enclosed

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1 495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status

SEND ALL CORRESPONDENCE TO.

Kenyon & Kenyon
One Broadway
New York, New York 10004

SIGNATURE

Richard L. Mayer, Reg. No. 22,490
NAME

11/15/99
DATE

234306

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s)	:	Wolfgang DULTZ et al.
Serial No.	:	To Be Assigned
Filed	:	Herewith
For	:	INTERFEROMETER (as amended)
Examiner	:	To Be Assigned
Art Unit	:	To Be Assigned

Assistant Commissioner
for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

SIR:

Kindly amend the above-identified application before examination, as set forth below.

IN THE TITLE:

Please replace the title with the following:

--INTERFEROMETER--.

IN THE SPECIFICATION:

Please amend the specification as follows:

On page 1, before line 1, insert:

--FIELD OF THE INVENTION--.

On page 1, line 1, before "invention" insert --present--.

On page 1, line 2, delete "according to the".

On page 1, line 3, delete "preamble of claim 1".

On page 1, before line 5, insert:

--BACKGROUND INFORMATION--.

On page 1, line 22, after "e.g." insert --,--.

On page 2, before line 8, insert: --SUMMARY--.

On page 2, line 8, change "Therefore, the" to --An--, before "invention" insert --present--, and change "create" to --provide--.

On page 2, delete lines 15-19.

On page 2, delete line 21, and insert: --The present invention provides--.

On page 2, line 22, delete "available".

On page 2, line 35, delete "known and is".

On page 3, line 5, after "interferometer" insert --according to the present invention--.

On page 3, line 7, change "contains" to --includes--.

On page 3, line 22, change "if" to --when--.

On page 4, line 11, after "i.e." insert --,--.

On page 4, delete lines 13-15, and insert: --BRIEF DESCRIPTION OF THE DRAWING
The FIGURE illustrates an example embodiment of an interferometer in accordance with the present invention.

DETAILED DESCRIPTION--.

On page 4, line 20, before "beam" insert --conventional--, and delete ",".

On page 4, line 21, delete "known per se,".

On page 4, line 26, change "Let it be" to --Assume, for example,--.

On page 4, line 27, delete "assumed".

On page 4, line 35, delete "It must".

On page 5, line 1, change "be emphasized that the" to --The--.

On page 5, line 17, change "In the following, the" to --The--.

On page 5, line 18, after "detail" insert --below--.

On page 5, line 19, before "conventional" insert -- when tuning--.

On page 5, line 20, change "are tuned, in that" to --,--.

On page 5, line 22, before "invention" insert -- present--.

On page 5, line 26, before "invention" insert -- present--.

On page 5, line 27, change "- i.e." to --, i.e.,--.

On page 5, line 28, change "surface" (second occurrence) to --object--, and change "-" to --,--.

On page 5, line 29, change "Let it now be assumed" to --Assume--.

On page 5, line 31, after "i.e." insert --,--.

On page 6, line 2, change "50" to --40--.

On page 6, line 5, change "surface" to --object--.

On page 6, line 32, change "the" to --a conventional--, and delete ", which".

On page 6, line 33, delete "is known per se".

On page 7, line 10, change "already mentioned" to --described above--.

On page 7, line 12, change "already mentioned" to --described above--.

On page 7, line 23, change "an" to --a conventional--.

On page 7, line 24, delete ", known per".

On page 7, line 25, delete "se,", and change "preferred" to --advantageous--.

On page 7, line 33, after "i.e." insert --,--.

On page 9, delete line 1, and insert: --What Is Claimed Is:--.

IN THE ABSTRACT:

Please amend the abstract as follows:

Delete line 3, and insert: --An--.

Line 4, after "interferometer" insert --is described--.

Delete lines 8 and 9.

Line 10, change "For this purpose, the" to --measuring errors. The--, and delete "(10)".

Line 11, delete "(40)".

Line 12, delete "(50)" and "(30)".

Line 13, delete "(10)".

Line 14, delete "(60,70)".

Line 16, delete "(10)".

Line 17, change "; and an" to --. Additionally, an--, and change "80" to --is provided--.

Line 18, delete "(10)".

Line 20, delete "(80)".

Line 23, delete "(10)".

IN THE CLAIMS:

Please cancel, without prejudice, claims 1-5 in the underlying PCT application.

Please add the following new claims:

6. (New) A tunable interferometer for measuring an optical surface, comprising:

at least one light source;

a reference surface, light from the at least one light source impinging the reference surface, the reference surface reflecting a first interference beam;

a test object, light from the at least one light source impinging the test object, the test object reflecting a second interference beam;

at least one beam splitter, the first interference beam and the second interference beam striking the at least one beam splitter; and

a polarizer polarizing the first interference beam and the second interference beam so that the first

interference beam and the second interference beam each have a different polarization state relative to one another; and

an analyzer positioned at an output of the interferometer, the analyzer having a variable polarization state, the analyzer tuning the interferometer as a function of the polarized first interference beam and the second interference beam.

7. (New) The interferometer according to claim 5, wherein the interferometer is a two-beam interferometer, wherein the light is a linearly polarized light, and wherein the polarizer includes a first $\lambda/4$ retardation plate allocated to one of the reference surface and the test object, and a second $\lambda/4$ retardation plate positioned before the analyzer.

8. (New) The interferometer according to claim 5, wherein the analyzer includes a rotatable linear analyzer.

9. (New) The interferometer according to claim 5, wherein the analyzer includes an electrically tunable liquid-crystal element with a linear polarizer.

10. (New) The interferometer according to claim 5, wherein the analyzer is arranged physically separate from the interferometer.

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1-5 in the underlying PCT The new claims conform the claims to U.S. Patent and Trademark Office rules and do not add new matter to the application.

The above amendments to the specification and the abstract are, inter alia, to conform the specification and the abstract to U.S. Patent and Trademark Office rules and to correct informalities. The amendments to the specification and the abstract do not add new matter.

The underlying PCT Application No. PCT/EP98/02494 includes an International Search Report, dated August 26,

1998. The Search Report includes a list of documents that were uncovered in the underlying PCT Application. A copy of the Search Report is included herewith.

The underlying PCT Application also includes an International Preliminary Examination Report, dated July 12, 1999. An English translation of the International Preliminary Examination report is included herewith.

It is respectfully submitted that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

KENYON & KENYON

Dated: 11/15/99

By: 

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230089v1

INTERFEROMETER TUNABLE IN A NON-MECHANICAL MANNER BY A PANCHARATNAM PHASE

The invention relates to an interferometer, in particular for the measurement of optical surfaces according to the preamble of claim 1.

A conventional two-beam interferometer is used to measure optical surfaces by generating at the output an interference fringe pattern of the optical surface and, for example, supplying the pattern to a video camera for further processing. The light reflected by the optical surface, known also as a test wave field, contains aberrations because of lens defects and surface roughness at the surface to be measured, the aberrations being imaged by the interference fringe pattern. The local position of the deviations of the interference fringe pattern from an ideal fringe pattern (e.g. parallel fringes) correlates with the local position of the aberration in the test wave field and thus with the deviations of the optical test surface, for example, with respect to an ideally flat surface. Such a displacement of the interference fringe pattern because of aberrations may have a considerably adverse effect on the measuring sensitivity, because the fringe deformation, e.g. in the fringe maxima and minima, is not able to image the deformation of the test wave field as sensitively as in the regions with high intensity gradients. Therefore, it is desirable to be able to displace the interference fringe pattern in a defined manner, in order to improve the measuring accuracy. For this purpose, until now the reference surface or the test object itself has been moved or tilted in order to introduce an additional phase gradient into the interference beams and thus into the interference fringe pattern. In this manner it is also

possible to obtain clear-cut information about the aberration of the test wave field, this subsequently allowing the elimination of defects, e.g. in a flat test surface. However, the movement of large and heavy test objects or reference surfaces introduces further inaccuracies into the interferometer.

Therefore, the object of the invention is to create an improved interferometer which does not require a drive mechanism for moving a reference surface or test object in order to tune the interferometer, and which can be tuned in virtually vibration-free manner, thereby preventing measuring errors.

The objective of the invention is achieved by the features of claim 1,

Advantageous further developments are outlined in the subclaims.

The central thought behind the invention is to make available a tunable interferometer without it being necessary for the reference surface or test object to be moved in order to tune the interferometer. Usually, the tuning of an interferometer is understood to mean the changing of the optical path of one arm of the interferometer by moving or tilting the reference surface or test object, this introducing a defined phase into the interferometer. In contrast, tuning within the meaning of the invention means that a defined phase, the so-called Pancharatnam phase, is introduced into the interferometer, there being, however, no change in the relative position between the reference surface and the test object. The phenomenon of the Pancharatnam phase is known and is described in detail in the paper

"*Pancharatnams Phase in Polarization Optics*", published in Advanced Electromagnetism, T. Barratt et al., Editors Singapore, pages 357-375 by W. Dultz et al.

The interferometer includes at least one light source, a reference surface and a test object, as well as at least one beam splitter. The interferometer further contains an apparatus for the polarization of the interference beams, such that they each have a different polarization state at the output of the interferometer. Disposed at the output of the interferometer is an analyzer with a polarization state, variable in predetermined manner, for tuning the interferometer. Depending on the polarization state of the analyzer, an additional phase, the "Pancharatnam phase", is introduced into the interference beams of different polarizations, the result being that the interference fringe pattern, imaging the test object, is displaced by a predetermined distance.

A linear relationship between the extent of displacement of the fringe pattern and the position of the analyzer is obtained if, in a two-beam interferometer, the interference beams are polarized orthogonally with respect to each other. This is achieved in that, first of all, a linearly polarized light, preferably laser light, is present at the input of the interferometer, and in that the polarization apparatus includes a first $\lambda/4$ retardation plate, allocated to the reference surface or to the test object, and a second $\lambda/4$ retardation plate, positioned before the analyzer. The first retardation plate ensures that the light beams reflected by the reference surface and by the test object are polarized orthogonally with respect to each other. The second retardation plate converts the two beams into a left-

circularly polarized beam and a right-circularly polarized beam.

The analyzer may be a rotatable linear analyzer or an electrically tunable liquid-crystal element with a linear polarizer.

In order to afford the interferometer additional protection against vibration during tuning, the interferometer and the analyzer may be physically separate, i.e. even installed at different locations.

Following, the invention is described in greater detail with reference to an exemplary embodiment in conjunction with the Figure.

The Figure shows a two-beam interferometer 10, at whose input a linearly polarized laser light impinges which has previously passed through a linear polarizer 20. Subsequent to linear polarizer 20 is a beam splitter 30, known per se, which splits the incident light into at least two components. In the present example, a reference surface 40 is placed in the optical ray path which passes beam splitter 30. With reference to the light beam passing through beam splitter 30, there is an optical test object 50 after reference surface 40. Let it be assumed that reference surface 40 is a flat glass plate having the characteristic that it transmits 95% of the incident light and reflects 5% of the incident light back to beam splitter 30. In the present example, test object 50 is likewise represented by a glass plate which, in turn, reflects 5% of the incident light and transmits 95% thereof. Disposed between reference surface 40 and test object 50 is a $\lambda/4$ plate 60, hereinafter referred to as retardation plate 60 for the sake of simplicity. It must

be emphasized that the described relative position between reference surface 40, retardation plate 60 and the test object serves merely as an example. A second $\lambda/4$ plate 70, hereinafter referred to as retardation plate 70 for the sake of simplicity, is disposed in interferometer 10 in such a manner that the light beams reflected by reference surface 40 and test object 50 and deflected by beam splitter 30 are able to pass through retardation plate 70. A rotatable linear analyzer 80 is arranged downstream of retardation plate 70, so that the interference beams passing through retardation plate 70 strike on analyzer 80. Downstream of analyzer 80 is, for example, a video camera (not shown) which records the interference fringe pattern supplied by interferometer 10 at the output.

In the following, the mode of operation for tuning interferometer 10 is described in greater detail. It must be emphasized once again that conventional interferometers are tuned, in that reference surface 40 or test object 50 must be moved or tilted. However, interferometer 10 according to the invention can be tuned without it being necessary to move reference surface 40 or the test object. In other words, the relative position between reference surface 40 and test object 50 remains unchanged. This is achieved by the invention in that the interference beams - i.e. the beams reflected by reference surface 40 and test surface 50 - have different polarization states. Let it now be assumed that the light traversing linear polarizer 20 is polarized in the direction of the arrow, i.e. vertically. The vertically polarized light strikes beam splitter 30 and half of it, for example, is reflected to the outside, the other half penetrating beam splitter 30. The vertically polarized light first strikes on reference surface 40, at which 5%

of the light is reflected. The portion penetrating reference surface 50 passes through retardation plate 60, as a result of which the vertically polarized light undergoes a right-circulating polarization. If this light falls on test surface 50, the reflected light is then left-circularly polarized. The light reflected at test surface 50 passes through retardation plate 60 again. Having again traversed retardation plate 60, the light once again has a linear polarization which, however, is orthogonal with respect to the polarization of the light reflected at reference surface 40. The two reflected interference beams with polarizations that are orthogonal relative to each other strike, in turn, on beam splitter 30 which deflects half of the light intensity onto retardation plate 70. In retardation plate 70, the two interference beams undergo circular polarization, one of the beams being right-circularly polarized and the other being left-circularly polarized. Owing to this polarization state of the interference beams and the rotatable linear analyzer 80, there is a linear relationship between the displacement of the interference fringe pattern at the output of interferometer 10, and the rotational angle of linear analyzer 80. In order to tune interferometer 10, linear analyzer 80 is simply rotated in a predetermined manner, whereby the "Pancharatnam phase" is introduced into interferometer 10, the Pancharatnam phase causing the linear displacement of the interference fringe pattern. The rotation angle by which linear analyzer 80 must be rotated in order to cause a predetermined displacement of the interference fringe pattern can be accurately determined if use is made of the Poincaré sphere, which is known per se. The polarization states of the interference beams are on the poles of the Poincaré sphere, linear analyzer 80 moving on the equator when it

is rotated. The phase which in this manner is inserted into interferometer 10 is $\lambda = \frac{1}{2}\,\Omega(A, R, L, P)$ when Ω is the spherical excess of the spherical lune A, R, P, L, A on the Poincaré sphere. Therein, A is the linear polarization state of the light at the input of interferometer 10. R and L, respectively, stand for the right- and left-circulating polarization states of the two interference beams. The right- R and left- L circulating polarization states of the two interference beams are achieved, as already mentioned, by retardation plates 60 and 70. The right- and left-circularly polarized light (R, L) is, as already mentioned, present at the output of retardation plate 70. With the aid of rotatable linear analyzer 10, the Pancharatnam phase λ, which is proportional to the rotational angle of analyzer 80, is introduced between the left- and right-circularly polarized beams at the output of the interferometer. Through the defined rotation of analyzer 80, the Pancharatnam phase is changed in predetermined manner, and the interference fringes, recorded by the video camera, are displaced as if reference surface 40 or test surface 50 had been displaced. Instead of a rotatable linear analyzer 80, it is possible to employ an electrically tunable liquid-crystal element, known per se, with a linear polarizer. Particularly preferred is an electrically rotatable $\lambda/2$ retardation plate of the kind producible using modern liquid-crystal techniques. With such retardation plates, which operate very quickly, the axial orientation is rotated with the electric voltage.

Interferometer 10 can be tuned with all processes in which the two beams are differently polarized. However, the tuning is only linear, i.e. calculable, if the polarizations of the beams reflected at reference surface 40 and test object 50 are orthogonal and if the analyzer

moves on the symmetrically intermediate great circle on the Poincaré sphere.

Patent Claims

1. A tunable interferometer (10), in particular for the measurement of optical surfaces, having at least one light source, a reference surface (40) and a test object (50), and at least one beam splitter (30), characterized by an apparatus (60, 70) for the polarization of the interference beams such that, at the output of the interferometer (10), they have different polarization states relative to each other; and an analyzer (80), disposed at the output of the interferometer (10), with a polarization state, variable in predetermined manner, for tuning the interferometer (10).

2. The interferometer as recited in Claim 1, characterized in that the interferometer (10) is a two-beam interferometer; that linearly polarized light is present at the input of the interferometer; and that the polarization apparatus includes a first $\lambda/4$ retardation plate (60), allocated to the reference surface or to the test object, and a second $\lambda/4$ retardation plate (70), positioned before the analyzer (80).

3. The interferometer as recited in Claim 1 or 2, characterized in that the analyzer (80) is a rotatable linear analyzer.

4. The interferometer as recited in Claim 1 or 2, characterized in that the analyzer (80) includes an electrically tunable liquid-crystal element with a linear polarizer.

5. The interferometer as recited in one of Claims 1 through 4,
characterized in that the analyzer (80) is arranged physically separate from the interferometer (10).

Abstract of the Disclosure

The object of the invention is to create an improved interferometer which does not require a drive mechanism for moving a reference surface or test object in order to tune the interferometer, and which can be tuned in virtually vibration-free manner, thereby preventing measuring errors.

For this purpose, the interferometer (10) has at least one light source, a reference surface (40), a test object (50) and at least one beam splitter (30). For vibration-free tuning, the interferometer (10) also contains an apparatus (60, 70) for the polarization of the interference beams such that, at the output of the interferometer (10), they have different polarization states relative to each other; and an analyzer (80), disposed at the output of the interferometer (10), with a polarization state that is variable in predetermined manner, the analyzer (80), as a function of its polarization state, introducing a defined Pancharatnam phase into the interference beams for tuning the interferometer (10).

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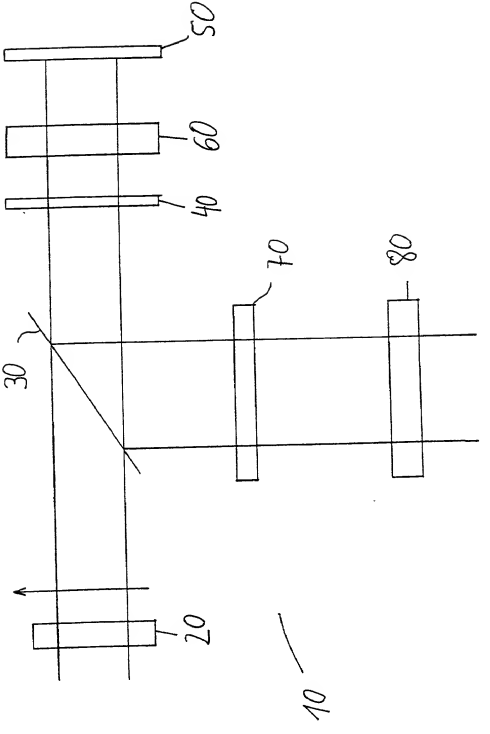
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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	
DECLARATION AND POWER OF ATTORNEY	ATTORNEY'S DOCKET NO. 2345/103

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name,

I believe I am an original, first, and joint inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled **INTERFEROMETER TUNABLE IN A NON-MECHANICAL MANNER BY A PANCHARATNAM PHASE**, the specification of which was filed as International Application No. PCT/EP98/02494 on 28 April 1998 and filed herewith in the United States Patent and Trademark Office.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

PRIOR FOREIGN APPLICATION(S)

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. § 119
GERMANY	**197 20 246.2**	**15 May 1997**		**YES**

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys:
Richard L. Mayer (Reg. No. 22,490)
Erik R. Swanson (Reg. No. 40,833)

SEND CORRESPONDENCE, AND DIRECT TELEPHONE CALLS TO:

Richard L. Mayer
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One Broadway
New York, New York 10004
(212) 425-7200 (phone)
(212) 425-5288 (facsimile)

I declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR	FAMILY NAME **BERESNEV**	FIRST GIVEN NAME **Leonid**	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY & ZIP CODE **Columbia 21044**	STATE OR FOREIGN COUNTRY **Maryland** MD	COUNTRY OF CITIZENSHIP **Russian**
POST OFFICE ADDRESS	POST OFFICE ADDRESS **10730 Faulkner Ridge Circle**	CITY & ZIP CODE **Columbia 21044**	STATE OR FOREIGN COUNTRY **Maryland**
Signature		Date January 10, 2000	

I declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR	FAMILY NAME **DULTZ**	FIRST GIVEN NAME **Wolfgang**	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY & ZIP CODE **D-65936 Frankfurt am Main**	STATE OR FOREIGN COUNTRY **Germany**	COUNTRY OF CITIZENSHIP **Germany**
POST OFFICE ADDRESS	POST OFFICE ADDRESS **Marienbergerstrasse 37**	CITY & ZIP CODE **D-65936 Frankfurt am Main**	STATE OR FOREIGN COUNTRY **Germany**
Signature		Date 27.11.99	
FULL NAME OF INVENTOR	FAMILY NAME **BERESNEV**	FIRST GIVEN NAME **Leonid**	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY & ZIP CODE **Columbia 21044**	STATE OR FOREIGN COUNTRY **Maryland**	COUNTRY OF CITIZENSHIP **United States of America**
POST OFFICE ADDRESS	POST OFFICE ADDRESS **10730 Faulkner Ridge Circle**	CITY & ZIP CODE **Columbia 21044**	STATE OR FOREIGN COUNTRY **Maryland**
Signature		Date	

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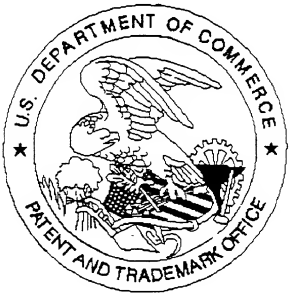

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